

## DISTRIBUTION OF RECENT OSTRACODA IN OFFSHORE SEDIMENT OF SELECTED STATIONS IN THE SULU SEA, SABAH

NORASWANA, N.F.\* , RAMLAN, O. and NORASHIKIN, S.

*School of Environmental and Natural Resource Sciences,  
Faculty of Science and Technology, National University of Malaysia,  
43600 UKM Bangi, Selangor.*

*\*E-mail: iswana08@gmail.com*

### ABSTRACT

A study on the distribution of recent ostracoda in offshore sediment was carried out around the Sulu Sea, in Sabah Malaysia. Sediment samples were taken from 12 sampling stations ranging in depth from 24 m to 205 m. Environmental parameters including water depths, salinity, temperature, dissolved oxygen, total organic matter and grain size were measured and their relationship with the distribution of recent ostracoda are discussed. From this study, a total of 32 species of ostracoda from 14 families and 22 genera were successfully identified. The dominant species was *Phlyctenophora orientalis* with 449 specimens. The number of species ranged from 3 to 19. Index of Diversity,  $H(s)$  value, was from 0.9 to 2.8. The abundance and diversity of ostracoda are principally controlled by the depth factor. A correlation analysis showed that depth is positively correlated ( $r = 0.588$ ,  $p < 0.05$ ) with Index of Diversity,  $H(s)$ . Other parameters do not show any significant correlation.

**Key words:** ostracoda, distribution, abundance, diversity, Sulu Sea

### ABSTRAK

Satu kajian mengenai taburan ostracoda resen di luar pantai telah dijalankan sekitar Laut Sulu, Sabah. Sampel sedimen telah diambil daripada 12 stesen pensampelan daripada julat kedalaman 24 hingga 205 m. Parameter-parameter persekitaran termasuk kedalaman air, saliniti, suhu, oksigen terlarut, jumlah bahan organik dan saiz butiran telah diukur dan hubungkait dengan taburan ostracoda resen telah dibincangkan. Daripada kajian ini, sebanyak 32 spesies ostracoda daripada 14 famili dan 22 genus telah berjaya dikenalpasti. Spesies dominan adalah *Phlyctenophora orientalis* dengan 449 spesimen. Bilangan spesies adalah di antara 3 hingga 19 spesies. Indeks Kepelbagaian,  $H(s)$  mencatatkan nilai di antara 0.9 hingga 2.8. Kepelbagaian dan kelimpahan ostracoda adalah dikawal oleh faktor kedalaman. Analisis korelasi menunjukkan kedalaman berkorelasi positif ( $r=0.588$ ,  $p<0.05$ ) dengan Indeks Kepelbagaian,  $H(s)$ . Parameter yang lain tidak menunjukkan sebarang korelasi yang signifikan.

**Kata kunci:** ostracoda, taburan, kelimpahan, kepelbagaian, Laut Sulu

### INTRODUCTION

Due to a wealth of defining features and a well calcified, tiny, bivalve carapace, which fossilizes easily, ostracoda are one of the best documented groups within the whole of the animal kingdom. They have been studied for two centuries and are known to inhabit a wide variety of aquatic environments such as marine, brackish, freshwater and even terrestrial. They also dwell as parasites in the intestines of fish and their distribution is

controlled by hydrobiological, biological and sedimentological features. Thus, ostracoda have an edge over foraminifera in biostratigraphic and ecological or paleoecological studies of non-marine strata. Ostracoda are adequate bioindicators of environmental changes as well as, the disappearance, replacement or the appearance of specific species (Hussain *et al.*, 2004).

An important work on the recent ostracoda of the Straits of Malacca was contributed by Whatley and Zhao (1987 and 1988). They identified 129 species from 18 bottom samples from depth ranges of 20 m to 100 m. The diversity of the fauna present

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\* To whom correspondence should be addressed.

is largely a function of the substrate, with the greatest variety of species found in the medium coarse sands rich in organic matter. Zhao and Whatley (1989) were studied on recent podocopid ostracoda in the southeastern Peninsular Malaysia. A total of 101 species of ostracoda were recorded and described from shallow waters (< 20 m) in the Sedili River and Jason Bay regions. The dominant species in the open sea environment were *Hemicytheridea reticulata*, *Neomonoceratina bataviana*, *Neomonoceratina delicata* and *Lankacythere coralloides*. The abundant species included *Actinocythereis scutigera*, *Alocopocythere kendengensis*, *Keijella jankeiji*, *Keijella papuensis*, *Parakrithella pseudadonta*, *Phlyctenophora orientalis*, *Pistocythereis bradyi*, *Tanella gracilis* and *Stigmatocythere rosemani*. A total of 51 species of ostracoda were identified in Pulau Tinggi, Johor (South China Sea) (Noraswana *et al.*, 2007). Omar & Faiz (2010) also recorded 47 species in offshore sediment around Pulau Besar, Johor (South China Sea). The objective of this study was to determine the distribution and abundance of benthic ostracoda in the Sulu Sea, Sabah, Malaysia and their relationship with environmental factors. This study will provide a more complete list of species and patterns of ostracoda distribution in relation to different environmental parameters.

## MATERIALS AND METHODS

A total of 12 sediment samples were taken from 12 sampling stations in the Sulu Sea, Sabah during the Sulu-Sulawesi Expedition on July 2009 at a latitude between 04°13.902'N to 06°44.054'N and a longitude between 117°50.047'E to 119°16.769'E (Table 1, Fig. 1). All the samples were taken from the bottom sediment using a 0.1 m<sup>2</sup> Van Veen Grab. Sediment samples were mixed with 4% formalin.

The environmental parameters including water depth, salinity, dissolved oxygen and temperature were measured by a CTD system during the sampling time.

For the grain size analysis, 20 g of each dried sediment samples (dried for 8 hours at 70°C) was mixed with tap water to a total volume of 250 mL and 10 mL of 5% sodium hexametaphosphate was used to separate the sediment particles. The sediments were then stirred mechanically (15 min), allowed to soak (overnight), stirred mechanically again (15 min), washed in a 0.063 mm sieve with tap water and dried again (overnight at 70°C). The remaining dried material on the sieve was transferred into the uppermost section of the stacked series of graded sieves (aperture 4, 2, 1, 0.5, 0.25, 0.125 and 0.063 mm). The remaining material on each sieve was then removed carefully and weighted. Lastly, the percentage of each particle fraction was calculated. Grain coarser than 2 mm was considered gravel, from 2 mm to 0.063 mm it was considered sand, from 0.002 to 0.063 mm it was considered silt and finer than 0.002 mm it was considered clay. Using the information of grain distribution, all samples were classified using a sediment triangular diagram of Folk (1980) on the basis of the percentage of sand, silt and clay.

The Total Organic Matter (TOM) in each sample was measured by calculating the loss of weight on ignition (Storer, 1984). Each crucible with 10 g of dried sediment samples was weighted (C) and dried in an oven (overnight at 105°C). After it was removed from the oven, it was allowed to cool and reweighed (A). Then, it was placed in a furnace (overnight at 400°C), removed from the furnace, cooled and reweighed again (B). The total content of organic matter (TOM) was determined according to the formula:

$$\text{TOM (\%)} = 100 (A - B) / (A - C)$$

**Table 1.** The environmental data according to sampling stations

Station	Coordinate	Depth (m)	Temperature (°C)	Salinity (ppt)	Dissolved oxygen (mg/l)	Organic matter (%)	Type of sediment
S1	06°44.054'N, 117°50.047'E	35	29.35	33.60	6.33	1.77	Silty sand
S2	06°00.097'N, 118°16.858'E	24	29.48	33.80	6.31	1.23	Sand
S3	05°52.604'N, 118°34.628'E	48	28.84	33.97	6.37	3.99	Sandy clay
S4	05°59.073'N, 118°39.240'E	66	28.22	34.11	6.43	12.80	Clayey mud
S5	05°33.427'N, 119°01.564'E	65	27.86	34.08	6.47	3.38	Clayey sand
S6	05°35.688'N, 119°04.004'E	108	29.96	33.96	6.58	1.64	Sandy mud
S7	05°07.039'N, 119°16.769'E	122	21.98	34.39	7.15	4.89	Clay
S8	04°52.431'N, 118°46.450'E	74	26.70	34.34	6.59	2.83	Clayey sand
S9	04°54.275'N, 118°36.149'E	54	28.38	34.19	6.41	2.70	Sand
S10	04°46.538'N, 118°36.526'E	72	26.52	34.31	6.61	5.66	Silty clay
S11	04°19.711'N, 118°00.685'E	119	23.92	34.62	6.90	3.95	Clayey silt
S12	04°13.902'N, 118°37.874'E	205	14.94	34.61	8.61	5.47	Silty clay



that had been recorded by earlier researchers (Whatley and Zhao, 1987 and 1988; Zhao and Whatley, 1989; Gou, 1990; Mostafawi, 1992; Dewi, 2000). Taxa were identified according to standard nomenclature classification (Moore, 1961; Martens and Horne, 2009).

## RESULTS AND DISCUSSION

For determining ostracoda, the samples were washed over three different size sieves: 500  $\mu\text{m}$ , 150  $\mu\text{m}$  and 0.063 mm. Only the first two size fractions were picked specially for ostracoda, while the last one was too fine and frequently barren. These techniques were also used in previous studies (Ramos *et al.*, 1999; Machado *et al.*, 2005). All live and dead specimens were picked, identified and counted from the dried samples under a light microscope. Only shells and empty carapaces were collected and no soft parts in the shells could be found. Photographs for each species were taken using a Tabletop Microscope 1000 (TM-1000) for clear identification. For further identification, the morphology features between the collected specimens were compared with ostracoda species

Ostracoda live in an environment in which the controlling factors are temperature, bottom topography, depth, salinity, dissolved oxygen, substrate, food supply and sediment organic matter. The quantities of environmental parameters including water depth, temperature, salinity and dissolved oxygen, total organic matter and type of sediment are shown in Table 1 and Table 2. The Sulu Sea is a marginal sea in the western tropical Pacific Ocean, rimmed by islands and sills mostly shallower than 200 m. The sea has homogeneous and warm water from the mesopelagic zone to the bottom at 5000 m. Salinity and dissolved oxygen are also almost constant in the mesopelagic and deeper layers (Nishikawa *et al.*, 2007). Station S12

Station	No. of species	No. of specimen	Index of Diversity, H(s)	Dominant species
S1	6	32	1.6	<i>Phlyctenophora orientalis</i>
S2	3	12	1.0	<i>Pistocythereis cribriformis</i>
S3	3	17	0.9	<i>Neomonoceratina bataviana</i>
S4	8	91	2.0	<i>Phlyctenophora orientalis</i>
S5	8	85	1.9	<i>Phlyctenophora orientalis</i>
S6	5	86	1.5	<i>Phlyctenophora orientalis</i>
S7	18	248	2.4	<i>Phlyctenophora orientalis</i>
S8	19	464	2.8	<i>Neonesidea chapmani</i>
S9	7	62	1.7	<i>Neonesidea chapmani</i>
S10	14	422	2.2	<i>Phlyctenophora orientalis</i>
S11	10	204	2.1	<i>Phlyctenophora orientalis</i>
S12	19	391	2.5	<i>Parakrithella australis</i>

showed the deepest value for water depth (205 m) and station S2 had the shallowest water depth (24 m) from all 12 sampling stations (Table 1). The Sulu Sea has an average depth of over 4400 m. The water temperature was decreased with the increased of water depth. For the water temperature, the maximum value was 29.48°C at station S2 and the minimum value was 14.94°C at station S12. Salinity in the benthic zone was nearby similar in all stations. Station S11 showed the maximum value, which was 34.62 ppt. The minimum value for salinity was 33.60 ppt at station S1. The range value of dissolved oxygen was between 6.69 mg/l to 8.16 mg/l (Table 1). The study on hydrography in the Sulu Sea by Nishikawa *et al.* (2007) recorded at range of water temperature between 10°C to 29°C and the salinity between 33 ppt to 35 ppt, while dissolved oxygen was between 1 ml/l to 5 ml/l.

The total of organic matter was high at station S4 (12.80%) and low at station S7 (1.23%). The sediment texture in this study area can be categorized as sand, sandy mud, sandy clay, silt, silty sand, silty clay, clayey sand, clay, clayey silt and clayey mud (Table 1). Pearson correlation analysis showed only water depth was significantly correlated ( $P < 0.05$ ) with the diversity of ostracoda, while other parameters (temperature, salinity, dissolved oxygen, organic matter and type of sediment) did not show any significant correlation. This may be due to the small number of samples.

#### Abundance, Dominance and Diversity of Ostracoda

A total of 32 species of 22 genera and 14 families were identified from about 2,114 specimens picked from 12 samples. Among the 14 families represented in the area, the Trachyleberididae family had the highest specific diversity with 11 species recorded and the most dominant family with the highest percentage, comprising 25.88% of all specimens. Representatives of these families are typical of infralittoral marine environments around the world. All the species recorded were benthic and tropical forms. The simple species diversity was from 3 to 19 species. The  $H(s)$  value was from 0.9 to 2.8 whereas the highest value was at station S8 and the lowest value was at station S3 (Table 2). The highest distribution of ostracoda was recorded at station S8 (19 species, 464 specimens) and station S2 had the lowest distribution of ostracoda (three species, 12 specimens). The dominant species was *Phlyctenophora orientalis* with 449 specimens (21.24%), followed by *Parakrithella australis* with 159 specimens (7.52%), and *Neonesidea chapmani* with 129 specimens (6.10%). *Phlyctenophora orientalis* was found widespread in all the sampling stations (Table 3).

Diversity, distribution, abundance and variation in the biotic factors provide information on energy

turnover in aquatic systems. For each species, in variable environments, different factors may limit distributions both temporally and spatially (Moghaddasi *et al.*, 2009). The abundance and diversity of ostracoda in the study area are most related to the depth factor. A correlation analysis showed that depth was positively correlated ( $r = 0.588$ ,  $p < 0.05$ ) with Index of Diversity,  $H(s)$  (Figure 2).

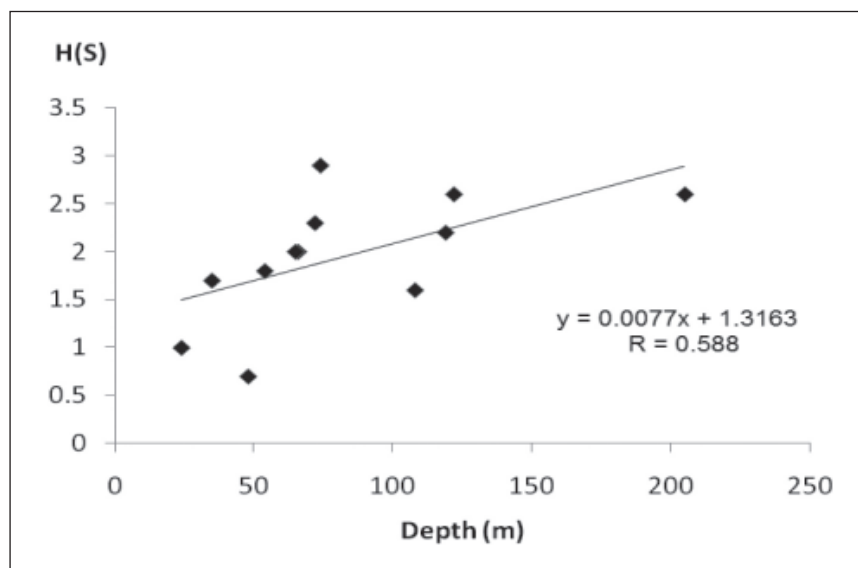
Although depth in itself is not thought to affect ostracoda distributions, it does control the variation of some important ecological factors. For example, both water density and hydrostatic pressure increase directly with depth, while light is reduced and substrates tend to become finer grained. The shelf or neritic assemblages live between 0 m to 200 m depth, and include many of the marginal marine forms. While the densest populations are found in the marginal areas, the highest diversities tend to occur in a shallow-shelf sea. In high energy shallow waters, both diversity and density of ostracoda are lower than in deeper and more stable environments. The absence or the lowest number of species in shallower samples, closer to the coast, is the result of the instability of the bottom sediment due to the wave action (Machado *et al.*, 2005).

The depth was also a controlling factor in the abundance and diversity of recent ostracoda in Straits of Malacca (Whatley and Zhao, 1987; 1988) and the southeastern Peninsular Malaysia (Zhao and Whatley, 1989). The observations made in their study revealed two broad assemblages based on water depth: shallow water fauna (< 50 m depth) comprising *Hemikritha peterseni*, *Neocytheretta snellii*, *Keijia labyrinthica*, *Keijella multisulcus*, *Cytherelloidea leroyi* and *Neocytheretta snellii*, and the deep water (> 50 m depth) assemblage was distinguished by *Bythoceratina paiki*, *Stigmatocythere parakingmai*, *Cytheropteron parasinense*, *Bythocytheropteron alatum*, *Keijella paucipunctata* and *Cytheropteron rhombiforme* (Whatley and Zhao, 1987; 1988). Earlier reports on recent podocopid ostracoda from southeastern Peninsular Malaysia (Zhao and Whatley, 1989) found that the common species, *Actinocythereis scutigera* and *Stigmatocythere roesmani* occur more frequently in deeper water (10 m to 20 m) and *Keijella jankeiji* and *Hemicytheridea reticulata* were confined to shallow water (0 m to 7 m).

Dewi (2000) reported that two biofacies can be distinguished based on water depth. Group I was distinguished by the species, such as *Actinocythereis scutigera*, *Alataconcha pterogona*, *Keijella paucipunctata*, *Foveoleberis cypraeoides* and *Neocytheretta novella* which are mainly distributed in deeper parts of the study area. While Group II represented the nearshore assemblages, occurring on the shallow part of the study area, were

**Table 3.** Distribution of species according to sampling station (individual per 3 g of dry weight sediment)

Species	Station Depth	S1 35	S2 24	S3 48	S4 66	S5 65	S6 68	S7 122	S8 74	S9 54	S10 72	S11 119	S12 205
<i>Alataconcha pterogona</i>						4		2	5		10	9	59
<i>Bythocytheropron alatum</i>								33					27
<i>Bythocytheropron</i> sp.					7			2			23		13
<i>Corallicythere</i> sp.								12				23	
<i>Cytherella incohota</i>						6			24			10	
<i>Cytherelloidea malaccaensis</i>								9	20			32	5
<i>Cytherella semitalis</i>								8	32		36		
<i>Cytherelloidea cingulata</i>					15			8	33		24		2
<i>Cytheropron parallelacostatum</i>							3				28	21	
<i>Foveoleberis cypraeoides</i>									14				5
<i>Hemicytheridea reticulata</i>		2	3							6			
<i>Bosasella elongata</i>							10						
<i>Keijella karwarensis</i>												20	
<i>Keijella kloempitensis</i>									15		17		10
<i>Keijella multisulcus</i>					7	11		5	30		33		12
<i>Keijella papuensis</i>					12	12			34				13
<i>Keijella paucipunctata</i>					11			4	40		45		17
<i>Keijella</i> sp.								8	23			3	
<i>Lankacythere euplectella</i>					12			12			20		15
<i>Loxoconcha paiki</i>							14	5	18				
<i>Loxoconcha</i> sp.							11		5				
<i>Neocytheretta adunca</i>					6	11			14		13		7
<i>Neocytheretta spongiosa</i>									35				24
<i>Neomonoceratina bataviana</i>		8		10						13	3		
<i>Neonesidea chapmani</i>							18		50	17	30	11	3
<i>Parakrithella australis</i>		1				5		27	15	7	7		97
<i>Pedicythere</i> sp.								2					
<i>Phlyctenophora orientalis</i>		10	3	2	21	27	33	61	48	15	145	38	46
<i>Pistocythereis bradyi</i>		3											9
<i>Pistocythereis cribriformis</i>		8	6	5						3			
<i>Propontocypris rostrata</i>								13					
<i>Trachyleberis</i> sp.						9		34	9	1	16	30	6
<b>Total</b>		<b>32</b>	<b>12</b>	<b>17</b>	<b>91</b>	<b>85</b>	<b>86</b>	<b>248</b>	<b>464</b>	<b>62</b>	<b>422</b>	<b>204</b>	<b>391</b>

**Fig. 2.** The value of H(s) was increased with increasing water depth (m)



characterized by the dominance of *Cytherelloidea leroyi*, *Neomonoceratina bataviana*, *Cytherella semitalis* and *Cytherelloidea malaccaensis*. Fauzielly *et al.* (2012) also found that the total density and species diversity of ostracoda in Jakarta Bay tended to increase towards the outer part of the bay, with increasing water depth. However, the dominant species decrease in density with increasing water depth.

In order to eliminate rare species, 24 species which are represented by more than 1% were selected for cluster analysis. Figure 3 displays groups of species assemblages of ostracoda in a dendrogram based on the performed cluster analysis and nMDS ordination. At a 30% similarity level, there are one major and two minor associations of benthic ostracoda species assemblages in the study area.

Major association:

i) *Phlyctenophora* association

Dominant species: *Phlyctenophora orientalis*

Other constituent species: *Alataconcha pterogona*, *Cytherella incohota*, *Cytherella malaccaensis*, *Cytherella semitalis*, *Cytherelloidea cingulata*, *Keijella kloempitensis*, *Keijella papuensis*, *Keijella multisulcus*, *Keijella paucipunctata*, *Keijella sp.*, *Lankacythere euplectella*, *Loxoconcha paiki*, *Neocytheretta adunca*, *Neocytheretta spongiosa*, *Neonesidea chapmani*, *Parakrithella australis*, *Trachyleberis sp.*

Distribution: The dominant species; *Phlyctenophora orientalis* shows a high abundance and is widespread throughout the entire study area. Other species show a high abundance at station S8 and S10, where the water depth is 50 m to 100 m.

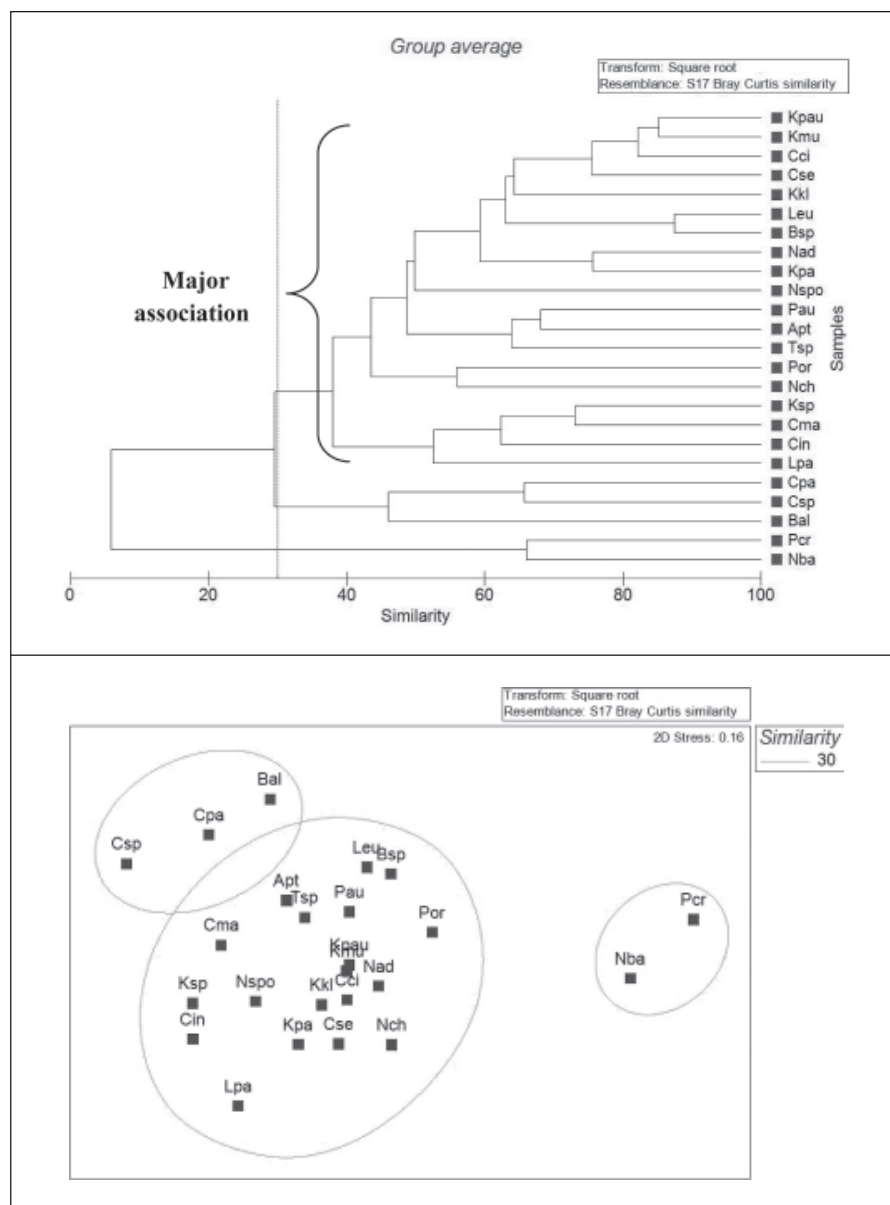


Fig. 3. Cluster analysis and nMDS ordination for species assemblages of ostracoda.

Minor association:

i) *Corallicythere* sp., *Cytheropteron parallelacostatum*, *Bythocytheroperon alatum* association

Species: *Corallicythere* sp., *Cytheropteron parallelacostatum* and *Bythocytheroperon alatum*

Distribution: These species were found in station S7, S11 and S12 where the water depth is more than 100 m.

ii) *Pistocythereis cribriformis*, *Neomonoceratina bataviana* association

Species: *Pistocythereis cribriformis* and *Neomonoceratina bataviana*

Distribution: These species were found in the station with a water depth less than 50 m (S1, S3 and S9).

The persistent occurrences of *Phlyctenophora orientalis* in all the samples suggest their wide range of tolerance to the observed environmental parameters in the study area. This finding is consistent with earlier research in the Straits of

Malacca (Whatley and Zhao, 1987) and the South China Sea (Mostafawi, 1992; Zhao and Whatley, 1989). Some of the species such as *Corallicythere* sp., *Cytheropteron parallelacostatum* and *Bythocytheroperon alatum* were found only in the stations where the water depth was more than 100 m. Deeper water neritic substrates, which tend also to be finer grained, support forms with smooth, thin, often translucent carapaces with relatively weak hinges, no eyes or eye spots and strong sculptures (e.g. *Bythocytheropteron*) commonly occur (Armstrong and Brasier, 2005). *Parakrithella australis* and *Neonesidea chapmani* were found in highest abundance at the station with a water depth more than 100 m. Several species such as *Pistocythereis cribriformis*, *Neomonoceratina bataviana* and *Hemicytheridea reticulata* were found in the stations with a water depth less than 50 m. These species had thick valves with eye spots, strong sculpture, amphidont hinges and conspicuously branched pore canals, which are common features in shallow-water ostracoda (Armstrong and Brasier, 2005).

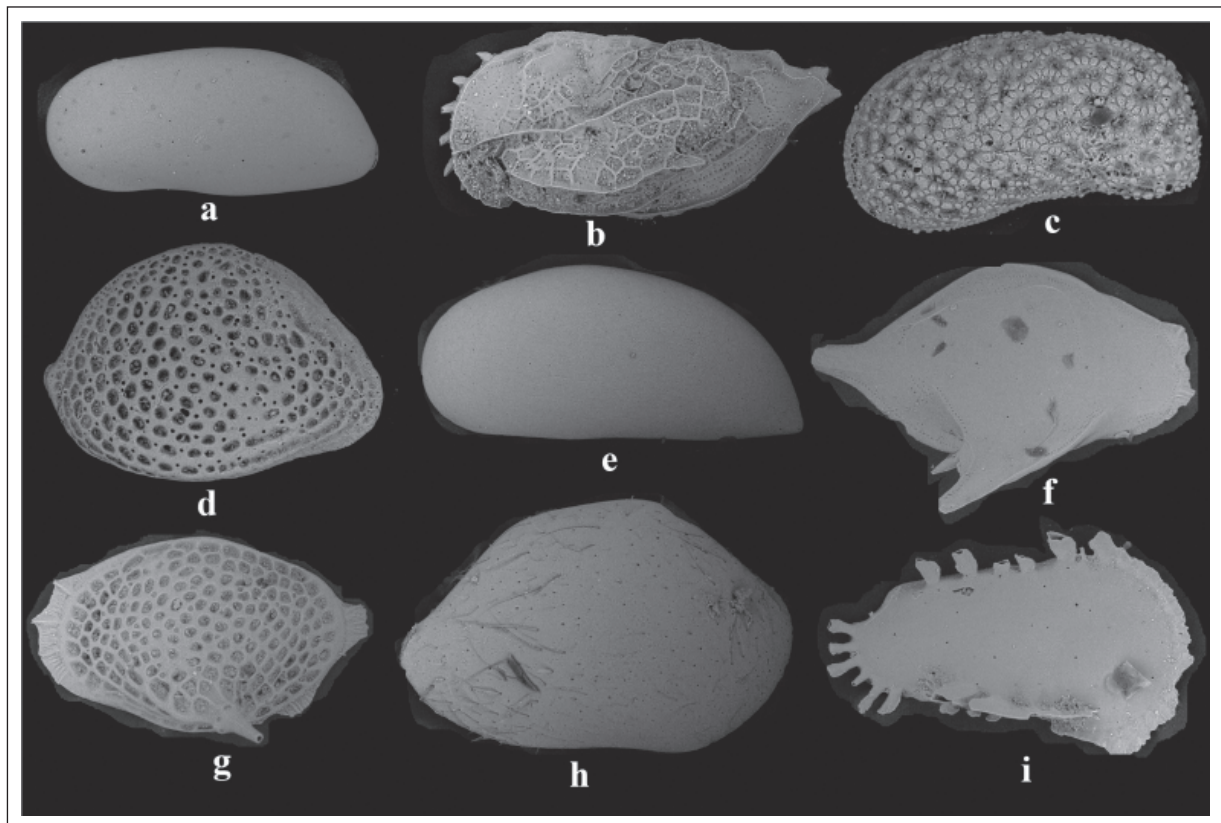


Fig. 4: **a)** *Parakrithella australis*, LV, TM-1000, x250, sample S12; **b)** *Neomonoceratina bataviana*, LV, TM-1000, x250, sample S3; **c)** *Corallicythere* sp., LV, TM-1000, x300, sample S11; **d)** *Foveoleberis cypraeoides*, RV, TM-1000, x250, sample S8; **e)** *Phlyctenophora orientalis*, LV, TM-1000, x150, sample S11; **f)** *Cytheropteron parallelacostatum*, RV, TM-1000, x250, sample S11; **g)** *Alataconcha pterogona*, LV, TM-1000, x250, sample S11; **h)** *Neonesidea chapmani*, RV, TM-1000, x180, sample S12; **i)** *Pedicythere* sp., RV, TM-1000, x250, sample S7.

**Phylum ARTHROPODA****Subphylum CRUSTACEA Pennant, 1777****Class OSTRACODA Latreilla, 1806****Order PODOCOPIDA Muller, 1894****Family CYTHERELLIDAE Sars, 1866**Genus *Cytherella* Jones, 1845Species *Cytherella incohota* Zhao & Whatley, 1989*Cytherella semitalis* Brady, 1868Genus *Cytherelloidea* Alexander, 1929Species *Cytherelloidea cingulata* (Brady, 1869)*Cytherelloidea malaccaensis* Whatley & Zhao, 1987**Family BAIRDIIDAE Sars, 1866**Genus *Neonesidea* Sohn, 1954Species *Neonesidea chapmani* Whatley & Downing, 1983**Family PARACYPRIDIDAE Sars, 1923**Genus *Phlyctenophora* Brady, 1880Species *Phlyctenophora orientalis* (Brady, 1868)**Family PONTOCYPRIDIDAE Muller, 1894**Genus *Propontocypris* Sylvester-Bradley, 1947Species *Propontocypris rostrata* Mostafawi, 1992**Family SCHIZOCYTHERIDAE Mandelstam, 1960**Genus *Neomonoceratina* Kingma, 1948Species *Neomonoceratina bataviana* (Brady, 1868)**Family XESTOLEBERIDAE Sars, 1928**Genus *Foveoleberis* Malz, 1980Species *Foveoleberis cypraeoides* (Brady, 1868)**Family LOXOCONCHIDAE Sars, 1925**Genus *Alataconcha* Whatley & Zhao, 1987Species *Alataconcha pterogona* (Zhao, 1985)Genus *Loxoconcha* Sars, 1866Species *Loxoconcha paiki* Whatley & Zhao, 1987*Loxoconcha* sp.**Family KRITHIDAE Mandelstam, 1960**Genus *Parakrithella* Hanai, 1961Species *Parakrithella australis* McKenzie, 1967**Family CYTHEROPTERONIDAE Muller, 1894**Genus *Cytheropteron* Sars, 1866Species *Cytheropteron parallelacostatum* Whatley & Zhao, 1987**Family HEMICYTHERIDAE Puri, 1953**Genus *Bosasella* Bonaduce, 1985Species *Bosasella elongata* (Hu, 1979)Genus *Corallicythere* Hartmann, 1974Species *Corallicythere* sp.Genus *Hemicytheridea* Kingma, 1948Species *Hemicytheridea reticulata* Kingma, 1948Genus *Pedicythere* Eagar, 1965Species *Pedicythere* sp.**Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948**Genus *Keijella* Ruggeri, 1967Species *Keijella karwarensis* (Bhatia & Kumar, 1979)*Keijella kloempritsensis* (Kingma, 1948)*Keijella multisulcus* Whatley & Zhao, 1988*Keijella papuensis* Brady, 1880*Keijella paucipunctata* Whatley & Zhao, 1988*Keijella* sp.Genus *Lankacythere* Bhatia & Kumar, 1979Species *Lankacythere euplectella* (Brady, 1869)Genus *Pistocythereis* Gou, 1983Species *Pistocythereis bradyi* (Ishizaki, 1968)*Pistocythereis cribriformis* Brady, 1865Genus *Trachyleberis* Brady, 1898Species *Trachyleberis* sp.**Family BRACHYCYTHERIDAE Puri, 1954**Genus *Neocytheretta* Van Morkhoven, 1963Species *Neocytheretta adunca* (Brady, 1868)*Neocytheretta spongiosa* (Brady, 1870)**Family BYTHOCYTHERIDAE Sars, 1926**Genus *Bythocytheropteron* Whatley and Zhao, 1987Species *Bythocytheropteron alatum* Whatley & Zhao, 1987*Bythocytheropteron* sp.



## CONCLUSION

Benthic ostracoda from bottom sediment of the Sulu Sea provided a more complete list of species from that area. Moreover, the patterns of ostracoda distribution in relation to different environmental parameters were evaluated. The recognised ostracoda fauna consisted of a total of 2,114 specimens of ostracoda from 14 families and 22 genera. In addition, 32 species were identified in the study area. *Phlyctenophora orientalis* was found widespread throughout the entire study area. The abundance and diversity were most related to the depth factor.

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